REMARKS

The Examiner's Action dated March 7, 2007, has been received, and its contents carefully noted.

In addition, appreciation is expressed to Examiners Foster and Lewis for their courtesy and constructive assistance during the personal interview held with undersigned counsel on June 19, 2007.

STATEMENT OF SUBSTANCE OF INTERVIEW

During the interview held on June 19, 2007, the references of record were discussed and undersigned counsel explained how the present claims overcome the rejections of record.

In particular, it was pointed out that the present application and the primary reference (Kenyon) are directed to passive airbreathing fuel cells, whereas the other applied references disclose active fuel cells. The considerations underlying the construction of fuel cells of one type are different in the significant respects from those underlying the construction of fuel cells of the other type.

It was further pointed out that the present invention distinguishes over the prior art by the provision of

grooves in the porous oxygen passage plate, at the side the faces away from the oxygen electrode, whereas the primary reference does not disclose any grooves and the components that are provided with grooves in the secondary references are not porous oxygen passage plates and have grooves at the side facing the associated oxygen electrode.

Finally, it was pointed out that a particular object of the present invention is to provide compressed, or high density, air in the grooves, which is not disclosed in any of the applied references.

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In order to advance prosecution, claim 1 has been amended only in a minor respect, *i.e.* to provide proper antecedent basis for the reference to the "porous" oxygen passage plate, and dependent claims 12 and 13 have been added to more clearly define two particular features of the invention, which is that the porous oxygen passage plate is made of carbon and that the fuel cell comprises means for forcibly feeding air into the grooves in order to provide air having a high density in the grooves. Support for the recitations appearing in the added dependent claims will be found in the specification at page 9, line 4 and page 5, line 25-page 6, line 10, respectively.

The rejection claims 1, 2 and 5 as unpatentable over Kenyon in view of Lee is respectfully traversed for the reason that neither of these references discloses a fuel cell having a porous oxygen passage plate having a plurality of opened grooves on a surface thereof opposed to the oxygen electrode, the grooves being opened to an outer periphery of a porous oxygen passage plate and not extending to and therefore being closed to the central bore.

As noted in the explanation of the rejection, the primary reference, Kenyon, discloses a passive airbreathing fuel cell having a plurality of fuel cell units, each unit including a porous oxygen passage plate. As is acknowledged in the explanation of the rejection, this reference does not disclose an oxygen passage plate having a plurality of grooves. The purpose of the provision of a plurality of grooves in the oxygen passage plate according to the present invention is to enable an increased flow of oxygen into the fuel cell so that there is an ample supply of oxygen across the entire surface of the oxygen passage plate, and thus an increased flow of oxygen to the entire area of the polymer electrolyte membrane.

Because this essential feature of the present invention is lacking from the Kenyon disclosure, reliance has

been placed on a secondary reference, Lee, which is concerned with the design of an active fuel cell. The explanation of the rejection points out that Lee discloses a cooling system in which non-porous electrically conductive plates may contain an array of grooves in the faces that define a reactant flow field for distributing the fuel cell's gaseous reactants.

According to the disclosure provided in the Lee reference, each membrane electrode assembly 4, 6 is sandwiched between two porous gas permeable sheets, such as the sheets 34 and 36 sandwiching membrane electrode assembly 4. Reactant flow fields composed of a plurality of flow channels are provided in plate assemblies 8, 14 and 16. Each of these plate assemblies is specifically disclosed in the reference as being non-porous.

Thus, it is clear that Lee does not disclose the provision of a plurality of grooves in a porous oxygen passage plate, on a surface of that plate that is opposed to the oxygen electrode, and thus does not supply the disclosure that is lacking from Kenyon.

It follows that no reasonable combination of the teachings of these applied references would result in the fuel cell defined in application claim 1.

Moreover, those skilled in the art would have no logical reason to modify the passive fuel cell of Kenyon according to the teachings of Lee because these references disclose two fundamentally different types of fuel cells.

Active type fuel cells, such as that disclosed by Lee are of the type normally used in motor vehicles or for home use, in which hydrogen and air are continuously and forcibly fed into the fuel cell from external sources. A portion of this hydrogen and oxygen react together and contribute to the generation of electric power, while the portions that are not reacted are discharged out of the fuel cell, the discharged hydrogen being fed back to the fuel cell by a circulating pump.

In contrast, passive fuel cells, such as that disclosed by Kenyon, receive hydrogen from a gas cylinder under pressure, while air is allowed to flow into the fuel cell under atmospheric pressure. During operation of such a fuel cell, there is no continuous withdrawal of unused reactants.

Thus, one distinguishing characteristic of active fuel cells is that they require auxiliary equipment for positively feeding both hydrogen and air and for withdrawing unused reactants. The electric power required for operation

this equipment must be generated by the fuel cell, reducing the power available for other uses.

For the above reasons, those skilled in the art would understand that features of active type fuel cells cannot necessarily be incorporated into passive type fuel cells.

Furthermore, the invention differs from any device that could be obtained by combining the teachings of the applied references by the fact that the open grooves are on a surface of the porous oxygen passage plate that is opposed to the oxygen electrode. When, as in the case of the present invention, the grooves for supplying oxygen are provided on the side of the oxygen passage plate that faces away from the oxygen electrode, and the oxygen passage plate is clamped against the oxygen electrode by end plates, such as plate 24 shown in Figure 9 of the present application, the contact pressure between the oxygen passage plate and the oxygen electrode is more uniformed than would be the case if the grooves were provided in a metal clamping plate adjacent to the oxygen passage plate, with the grooves and their associated lands being directed toward the oxygen passage plate, as disclosed by Lee (and Reiser).

Thus, claim 1 distinguishes over any reasonabl;e combination of the teachings of the applied references by its recitation of a porous oxygen passage plate provided adjacent and toward the oxygen electrode and comprising a plurality of opened grooves on a surface thereof opposed to the oxygen electrode, the grooves being closed to the central bore.

In connection with the above-cited claim recitations, it should also be noted that the primary reference does not disclose grooves and the secondary reference does not disclose grooves that are closed to a central bore.

Claim 2 further distinguishes over any reasonable combination of the teachings of the applied references by its recitation of blowers for blasting air into the grooves. This feature is not disclosed in either of the applied references; the Lee reference simply discloses that oxygen may be supplied from a storage tank.

Claim 5 further distinguishes over the applied references by its recitation that the outer peripheral surface of the cell stack is rectangular in shape. Although this shape is disclosed by Lee, it is clearly different from the shape disclosed by Kenyon and there is no evidence that those skilled in the art would modify the shape of the passive fuel

cell of Kenyon in accordance with the disclosure of the active fuel cell in Lee.

In connection with the last point, it is submitted that the assertion presented in the last two lines on page 5 of the Action is incorrect; there is no disclosure in Kenyon that the embodiment shown in Figure 6 thereof has an outer peripheral surface that is rectangular in shape.

The rejection of claim 2 as unpatentable over Kenyon in view of Reiser, presented in Section 3 of the Action, is also traversed, for the reason that the fuel cell defined in claim 2 is not obvious in view of any reasonable combination of the teachings of the applied references.

The secondary reference relied upon to support this rejection, Reiser, discloses, like Lee, an active fuel cell. Therefore, all of the arguments presented above regarding the absence of any motivation for those skilled in the art to combine teachings relating to, respectively, a passive fuel cell and an active fuel cell are equally applicable to the rejection of claim 2.

Moreover, Reiser, like Lee, fails to supply the feature that is missing from Kenyon, relating to the provision of a porous oxygen passage plate provided adjacent the oxygen

electrode and provided with a plurality of opened grooves on a surface thereof opposed to the oxygen electrode.

Reiser does not, in fact, appear to disclose a porous oxygen passage plate. In the fuel cell disclosed in this reference, for example as illustrated in Figure 3D, grooves 28 are formed in the side of a plate 40 that faces toward cathode 22. Plate 40 is not an oxygen passage plate, but is only disclosed as being provided to allow water removal.

Furthermore, reference is made to the explanation provided earlier herein regarding the benefit of providing grooves at the side of the oxygen passage plate that is opposed to the oxygen electrode.

It is therefore clear that one skilled in the art could not derive from the Reiser patent any suggestion for providing a porous oxygen passage plate with grooves at the side of that plate that faces away from the oxygen electrode.

Moreover, it appears that Reiser does not even disclose a component that can be equated to the oxygen passage plate defined in application claim 1 because there is no disclosure in this reference that oxygen passes though any of the plates provided with grooves.

Furthermore, the addition of blowers to the passive fuel cell of Kenyon would be clearly contrary to the disclosure of that reference, which relates to a passive fuel cell.

The rejection of claims 3 and 4 as unpatentable over Kenyon in view of Reiser is also respectfully traversed.

Claim 3 distinguishes over any reasonable combination of the teachings of those references by its recitation that the blowers are arranged in opposition to both opened ends of the groove. Of course, the result of this arrangement is to force air into the grooves from both ends thereof, thereby creating high air pressure in the grooves.

As already noted above, it would be contrary to the teachings of Kenyon to add any air blowers to the passive air cells disclosed therein.

Wholly aside from that fact, it would certainly be contrary to the teachings of each of the applied references to arrange blowers in opposition to both opened ends of the grooves. Reiser clearly discloses an arrangement in which air is caused to flow across the fuel cell, being introduced at one side thereof and being withdrawn through an outlet manifold 14B at the other side thereof. The entire purpose of

the arrangement disclosed by Reiser is to produce a continuous flow of air through the fuel cell. This is directly contrary to an arrangement of the type defined in claim 3 in which air is blown in at both ends of the grooves, creating high air pressure within the grooves and essentially allowing air to exit only through the porous oxygen passage plate.

With regard to the entirety of the explanation of this rejection, as presented on pages 7 and 8 of the Action, it can only be reiterated that to arrange blowers in the manner defined in claim 3 of the present application would be directly contrary to the teachings of Reiser and would provide an effect, that is a high air pressure, that is directly contrary to the effect intended by Reiser, which is a continuous flow of air across the fuel cell.

Moreover, the arrangement of grooves disclosed by Reiser cannot be employed in a fuel cell having the form disclosed by Kenyon, which includes a central core that is separated from the region containing oxygen and that constitutes a source of fuel.

New dependent claim 12 further distinguishes over the applied references by specifying that the oxygen passage plate is made of carbon. This is a material that can be

provided with grooves more easily than the metal plates disclosed by Lee and Reiser.

New claim 13 clearly distinguishes over the applied references by its recitation of a basic novel feature of the invention which, is noted above, represents an effect that is directly contrary to that which occurs in the fuel cell of Reiser.

Furthermore, it is now requested that the Restriction Requirement be withdrawn in view of the fact that claims 6-11 do, in fact, define the same apparatus, and in fact the same embodiments, as claims 1-5, 12 and 13.

In view of the foregoing it is requested that the Restriction Requirement be withdrawn, that all claims be examined on the merits, that the prior art rejections be reconsidered and withdrawn, that claims 1-13 be allowed and that the application be found in allowable condition.

If the above amendment should not now place the application in condition for allowance, the Examiner is invited to call undersigned counsel to resolve any remaining issues.

Respectfully submitted,

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